

# NASA DLA Barometric Pressure Manufacturer Survey Results

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- 1. Status since January 2022 MIL-STD-750 Test Methods JEDEC Meeting**
- 2. Survey**
- 3. Status**
- 4. Summary**

# Status since January 2022 MIL-STD-750 Test Methods JEDEC Meeting

- Developed list of preliminary questions requesting information how barometric pressure testing per MIL-STD-750-1 is performed at DLA Land and Maritime qualified manufacturer facility
- Collaborated with DLA Land and Maritime and Infineon personnel to refine survey questions.
- NASA/ DLA survey of DLA Land and Maritime manufacturers MIL-STD-750-1 Test Method 1001 Barometric Pressure (Reduced) testing released on February 15, 2022. Survey response date was April 1, 2022.
- DLA Land and Maritime released the same survey to the user community on February 15, 2022. Survey response date was April 1, 2022.

# Survey



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**NASA - DLA Land And  
Maritime Survey of Qualified Product List  
Manufacturers to Understand  
Barometric Pressure Testing Electrical  
Biasing Conditions**

Report No.: JPID-FY22-000429

Prepared by:

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February 15, 2022

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# Survey Questions

1. Does your company perform testing as per MIL-STD-750-1, Test Method 1001? Please provide detailed information on how this test is performed.
2. Does your company utilize an outside test laboratory to perform this testing? If so, please identify the company and test laboratory performing this test.
  - a) If available, please provide information that details how the outside test laboratory performs this test?
3. Should clarification be added to the test method to specify whether the voltage should be applied between biased terminals in a manner as a DWV test (method 1081 of MIL-STD-750) or be applied in a case to biased terminals manner consistent with the device usage within a circuit/system (e.g. between Drain and Source for a MOSFET)?

# Survey Questions

4. Should device bias testing at maximum voltage under rated conditions be performed as part of this test method in order to comply with the procedure paragraph?
5. Should the test method specify additional information for different package types and for specific pin/lead configurations using isolated versus non-isolated packages as an example?
6. Should both DWV and biased testing be performed as part of this method? Please provide rationale why one method is preferred over the other method if only one method is to be performed.
7. Should the method distinguish separate bias conditions for isolated and non isolated packages?

# Manufacturer Survey Results

- All DLA Land and Maritime Qualified manufacturers surveyed – 13 total.
- Total number of DLA Land and Maritime manufacturer survey responses – 5.
- Percent of surveyed manufacturers responding – 38 percent.
- One manufacturer's response was their products don't require barometric pressure testing.

# Manufacturer Survey Results

Questions	Mfr #1	Mfr #2	Mfr #3	Mfr #4	Mfr #5
1. Does your company perform testing as per MIL-STD-750 Test Method 1001?	Yes	Yes	Yes	No	Yes
2. Does your company utilize an outside test laboratory to perform this testing?	No	Yes, for altitudes greater than 80K feet.	No	N/A	No
3. Should clarification be added to the test method to specify whether the voltage should be applied between biased terminals in a manner as a DWV test (method 1081 of MIL-STD-750) or be applied in a case to biased terminals manner consistent with the device usage within a circuit/system (e.g. between Drain and Source for a MOSFET)?	Yes. The current test method language is not clear in terms of defining the intent of the method – different interpretations are possible.	Altitude is end application requirement.	We interpret the test, maximum rated voltage ( Vcb, Vds, Vr) is currently required by the test method. Note: The DWV rating is not generally included in the maximum ratings.	N/A	Yes, the DWV references should be removed.



# Manufacturer Survey Results

Questions	Mfr #1	Mfr #2	Mfr #3	Mfr #4	Mfr #5
4. Should device bias testing at maximum voltage under rated conditions be performed as part of this test method in order to comply with the procedure paragraph?	Our review of the test method, and review of the way in which current 19500 slash sheet requirements are specified for our current QPL devices, we believe that the testing is intended to be performed in a manner which simulates actual device application.	The test should be done at end application maximum voltage.	Our interpretation of the test method is that the following criteria is required by the test method, maximum rated voltage ( Vcb, Vds, Vr) is currently required by the test method. Note: The DWV rating is not generally included in the maximum ratings.	N/A	Sometime difficult to say – if bias is 250v but isolation is 1000v -- which should actually control? Max voltage rating

# Manufacturer Survey Results

Questions	Mfr #1	Mfr #2	Mfr #3	Mfr #4	Mfr #5
5. Should the test method specify additional information for different package types and for specific pin/lead configurations using isolated versus non-isolated packages as an example?	"The test method should provide standardized methods, which would be applicable for as many different device types as possible. Specifying additional information for different package types, (i.e. insulated vs. non-insulated), different pin/lead configurations, etc. has the potential to overly complicate the method.	Isolated packages failure modes are a) pin to pin. b) or pin to case.	These details are best left to the individual slash sheet based on the DUT voltage rating and the package style.	N/A	No, applicable for 1081.

# Manufacturer Survey Results

Questions	Mfr #1	Mfr #2	Mfr #3	Mfr #4	Mfr #5
6. Should both DWV and biased testing be performed as part of this method? Please provide rationale why one method is preferred over the other method if only one method is to be performed.	Believe that DWV method testing should not be included. As stated in response to section 4. above, adding a requirement for additional DWV testing would require device re-characterization, and updates to existing slash sheets. We do not believe that DWV testing would represent the actual performance of the device when installed in customer's next-level assembly.	Yes both DWV and biased testing should be done. This may not be applicable to axial diodes, but it is applicable to isolated packages.	<p>"If barometric pressure of DWV is required it should be specified in the detailed specification. Similar to the way the DWV paragraph is included in many slash sheets ( /738, /712, /663, /698, /685 for example).</p> <p>Another point is that many airborne systems use conformal coating to improve the reliability by protecting against things like condensation, particles, and high altitude arching. It could be argued that the performance of DWV at altitude is beyond the requirements for a device specification."</p>	N/A	No, DWV is performed per test method 1081 as applicable and specified in performance sheet.

# Manufacturer Survey Results

Questions	Mfr #1	Mfr #2	Mfr #3	Mfr #4	Mfr #5
7. Should the method distinguish separate bias conditions for isolated and non isolated packages?	See response to 5. above	Yes. But this is driven by end use application.	it is not required in the test method, assuming that the detail specification has the details.	N/A	No, remove DWV wording, see question 6.

# Survey Summary

- Four of thirteen suppliers responded for a 31 percent response rate. One of four respondents stated that this wasn't applicable to their products. Only one supplier used an outside test facility for specified altitude testing.
- Intent of the test method is not clearly defined. Agreement that the test method needs clarification.
- Agreement that test method should provide methodology for testing with the specification sheets providing device specific test information.
- Responses were mixed on including Dielectric Withstanding Voltage as a test method requirement.
- Agreement that test method should leave device biasing options based on package type at the specification sheet level.

# Proposal

A DLA qualified manufacturer has proposed the following clarification to the test method.

- When applying bias to samples for the purpose of reduced barometric pressure testing, the bias shall be applied as follows:
  - For MOSFET, apply the max rated BVDss between Drain and Source (gate shorted to Source).
  - For diode, apply the max rated reverse bias between diode cathode and anode.
  - Justification:
    - This method is consistent with section 3 of method 1001.4, in that it represents the worst case maximum voltage under rated conditions.
    - In cases where existing MIL-PRF-19500 slash sheets define the bias conditions, the requirements are for VDS bias.

# Future Plans

- Review DLA EP study user survey responses on barometric pressure test method and proposal for clarification to test method.
- Work with DLA and MIL-STD-750 test methods task group to review responses and make recommendations for test method update.
- Work with DLA to determine why the DWV verbiage was added to the test method and whether it is still needed.

# Thank you!

- We would like to express our appreciation to the task group members, NASA NEPAG and SLS programs, Government Working Group, and DLA Land and Maritime for their continued support of this effort.

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# Acronyms

- DLA – Defense Logistics Agency
- DPA – Destructive Physical Analysis
- DWV – Dielectric Withstanding Voltage
- EP – Engineering Practice
- ESD – Electrostatic Discharge
- JEDEC – JEDEC Solid State Technology Association
- MIL-STD – Military Standard
- MOSFET – Metal Oxide Semiconductor Field Effect Transistor
- MSFC – Marshall Space Flight Center
- NASA – National Aeronautics and Space Administration